

I claim:

1. A vehicle safety system comprising:
  - a safety system controller;
  - a seat belt frame;
  - a seat belt spool mounted for rotation on the seat belt frame, containing a quantity of seat belt webbing;
  - an energy-absorbing mechanism positioned between the seat belt frame and the seat belt spool;
  - an engagement mechanism which selectively connects the energy-absorbing mechanism between the seat belt frame and the seat belt spool so that withdrawal of the seat belt webbing from the seat belt spool causes deformation of the energy-absorbing mechanism;
  - a motion sensor mounted to the seat belt frame, the sensor operable to detect rotation of the seat belt spool; and
  - wherein the safety system controller is in information receiving relation with the motion sensor and in controlling relation with at least one deployable safety system.
2. The vehicle safety system of claim 1 wherein the safety system controller is in information receiving relation with the engagement mechanism.
3. The vehicle safety system of claim 1 wherein the energy-absorbing mechanism is a torsion bar.
4. The vehicle safety system of claim 1 wherein the at least one deployable safety system includes an airbag.
5. The vehicle safety system of claim 1 wherein the vehicle safety system is in information receiving relation with at least one crash sensor.

6. A vehicle safety system comprising:

a safety system controller;

a slider frame;

a slider mounted for motion on the slider frame, and a quantity of seat belt webbing mounted or positioned with respect to the slider so that linear motion of the slider with respect to the slider frame allows extension of the seat belt webbing;

an energy-absorbing mechanism positioned between the slider and the slider frame, and operable to absorb energy when the slider moves with respect to the slider frame;

a motion sensor mounted on the slider frame, the sensor operable to detect linear motion of the slider with respect to the frame;

wherein the safety system controller is in information receiving relation with the motion sensor and in controlling relation with at least one deployable safety system.

7. The vehicle safety system of claim 6 wherein the at least one deployable safety system includes an airbag.

8. The vehicle safety system of claim 6 wherein the vehicle safety system is in information receiving relation with at least one crash sensor.

9. A method of determining whether a vehicle occupant is properly restrained by a seat belt comprising the steps of:

monitoring at least one crash sensor with a safety system controller to determine the onset of a vehicle crash;

monitoring with a displacement sensor the angular or linear displacement of at least two structural elements between which a seat belt load limiter is connected to determine whether or not tension in a seat belt is causing energy to be dissipated in the load limiter;

using the safety system controller with onboard logic to deploy at least one safety system based on information from the at least one crash sensor and the displacement sensor.

10. The method of claim 9 further comprising the steps of:  
employing an acceleration actuated engagement mechanism to connect the energy-absorbing mechanism between the at least two structural elements; and

using the safety system controller to receive information from the engagement mechanism concerning the engagement of the energy-absorbing mechanism between the at least two structural elements.

11. A method of determining vehicle occupant loading against a seat belt comprising the steps of:

monitoring at least one sensor with a safety system controller to determine the onset of a vehicle crash;

monitoring with a displacement sensor the angular or linear displacement of at least two structural elements between which a seat belt load limiter is connected, wherein one of said structural elements is connected to the seat belt, to determine loading on the seat belt;

using the safety system controller with onboard logic to change the parameters of deployment of at least one safety system based on information from the determined loading of the seat belt.

12. The method of claim 11 wherein the sensor monitored, monitors the activation of an engagement mechanism which engages the seat belt load limiter to the at least two structural elements .

13. The method of claim 11 wherein the sensor monitored is a crash sensor.